

**IS 2927 Independent Study in Systems & Technology
Applications of Information Technology**

**Adaptive Online Course Recommendation System
Part II**

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PROJECT OVERVIEW

- **Course: IS 2927 Independent Study in Systems & Technology – Applications of Information Technology**
- **Term: Spring 2004**
- **Advisor: Dr. Peter Brusilovsky**
- **Topic: Adaptive Online Course Recommendation System – Part II**

OBJECTIVE

Continue to implement, improve and document the Adaptive Online Course Recommendation System – CourseAgent, which is a web-based application with more enhanced adaptive functionality, integrating capability of accessing database through the Internet as OLOP and as well as OLAP, supporting logins to retrieve personalized information and settings, and providing more dynamic user-oriented information retrieval through a user-friendly interface.

INTRODUCTION

The Internet is the kingdom of information and with all kinds of accessibilities people are able to get any information they need from it. One concern here is how often the obtained information is really what users needed or how easy users can discover the most relevant information from the jungle. How does it sound that a smart system could bring the most relevant information to you?

The smart system we talk about here would do some kind of thinking, actually is logic algorithm analysis. To decide what information is most relevant based on users' preferences so that to ease the whole process of finding the most useful information for users. This feature is referenced as adaptive functionality.

Adaptive systems demand on users interaction a lot before bringing out the powerful effects. The system must first learn about its users well enough so that it could show them something really meaningful. Therefore, users need to provide information about themselves either through storing their preferences in the system database or interacting with the system. Based on those personalized information gathered from the interaction, the system will follow certain analysis algorithm and display the most relevant result. Without understanding users, the adaptive system will just act like other regular system and provide the same information to everyone.

SYSTEM OVERVIEW

The adaptive application we are developing is a web-based *Adaptive Online Course Recommendation System*, which will be referenced as *CourseAgent* throughout this documentation.

The creation of this project is for an independent study practice. This project is to develop an adaptive online course recommendation system for the School of Information Sciences based on the purpose of providing a better course recommendation system to meet the needs of students while making suggestions on courses according to different needs and interests of each individual. That is how the idea of *CourseAgent* is generated.

There are three types of target users defined in the system: *students, faculties, and School Administration Employees*. In order to have access to the system and take advantage of it,

users are required to be a student, a professor or a staff in the School of Information Sciences to have an account with **CourseAgent**, and all the system required data is only related to the IS School, such as programs, courses, faculties, and students. Through **CourseAgent**, people could not only get basic information about courses offered in the School but also more dynamic personalized information.

The system has three major sections, one is actual course recommendation section **CourseAgent**, one **AdviseAgent** is for faculties to give advices to students, and the other **AdminAgent** is for system administration. The **AdminAgent** is for school related data management and only accessed by school employees. The **CourseAgent** and **AdviseAgent** are for students and faculties to interact with the system. Through the interaction, users provide their own preferences, their opinions about courses, and their suggestions. Based on those provided information, the adaptive functionality is then developed in the system. Moreover, the system will take suggestions from the advisor and people's feedback on each course into consideration while making recommendations.

Although the system is originally designed for students' benefits, it also benefits the School in some good ways. For example, students provide their opinions and make suggestions about courses. The School will then have the best reference to improve the program to meet students' needs. **CourseAgent** is such a practical and favorable system to satisfy the real needs. I believe once the development is complete, the system would be applied over another schools or universities in the near future.

SYSTEM SPECIFICATIONS & ASSUMPTIONS

- ***System Profile***

Title: Adaptive Online Recommendation System
Developing Site: www.sis.pitt.edu/~lmao/IND_Study
Testing Site: www.sis.pitt.edu/~cagent
Web Server: Unix Server at IS School
Testing Account: cagent
Password: Tape,38
Database: Oracle Database at IS School
Password: Oragne34

- Purpose of Development

- Set up a well-organized course information system in the School of Information Sciences, which would be the best tool for both students and faculties.
- Provide people with more dynamic, personalized, and complete information about courses offered in the School of Information Sciences
- Give people proper recommendations on courses to take based on their personal needs, interests and schedules as well as advisor's suggestion.
- Establish a better media to gather students' feedbacks about courses as a guiding principle for future improvement while designing program

- ***Three system sections: CourseAgent, AdviseAgent, & AdminAgent***

For different type of users, the system provides different sections with needed tools and options. The ***CourseAgent*** is for students, the ***AdviseAgent*** is for faculties, and the ***AdminAgent*** is for school administration employees.

- **CourseAgent:** For students to view and set up their personal information for a personalized view of school courses and schedules. This is the major section of the whole system which has the most adaptive features.
- **AdviseAgent:** For faculties to view and set up their personal information, as well as advising students.
- **AdminAgent:** For school administration employees to view and set up all information for the system.

- ***Target Users: Students, Faculties, & School Administration Employees***

Students, faculties, and school administration employees are the major three types of users for this ***Adaptive Online Course Recommendation System***. They play different roles and have different responsibilities in the system. All of their interactions with the system and information provided to the system are very crucial to put the adaptive functionalities into effect.

- **Students:** Provide their personal information, suggestions, and opinions about courses, such as future career goals, course evaluations and curriculum suggestions. They are anyone who is currently enrolling in any of the programs providing at IS School. Alumni are not defined yet at the system, so they could still access the system and provide information after finishing the program.
- **Faculties:** Provide their personal information, recommendations, and opinions about courses, such as teaching plans, advising students, and curriculum modification. They are any faculty who is hired by IS School to teach, to advise students and to conduct researches.
- **School Administration Employees:** Provide all the basic information needed to run the system, such as faculties, students, courses, and schedules. They are IS School employees in the administration offices, such as Registration, Admission, and Graduation.

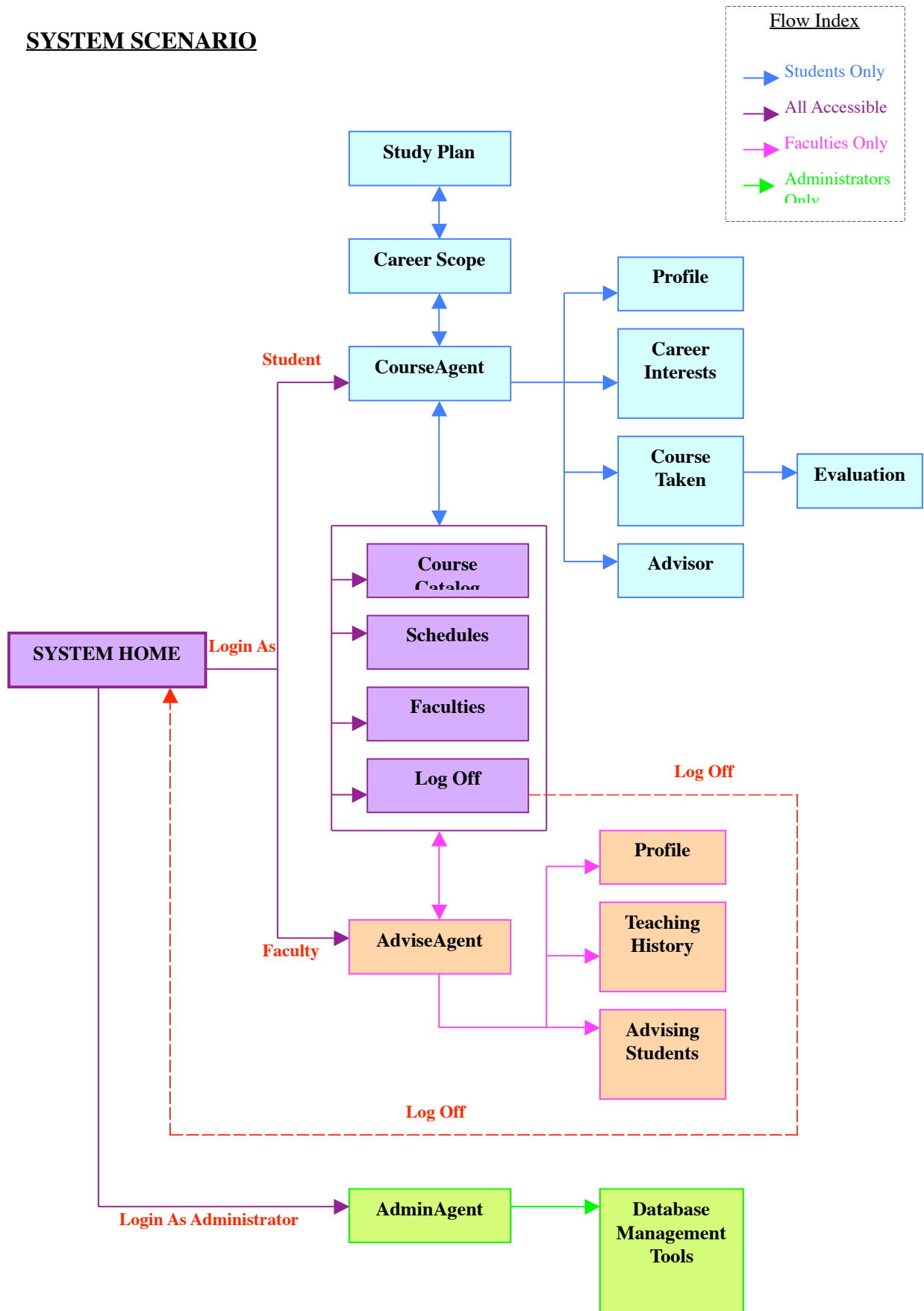
- ***System Features***

- Interactive and adaptive web pages
- Communicate and interact with database
- System login to retrieve related information
- Personalized information and navigation
- Gather and analyze information provided by users
- Suggest courses to meet the needs for each individual

- ***Expected Outcomes***

- Set of web pages with levels of adaptive functions
- Collected data in Oracle database

SYSTEM SCENARIO



IMPLEMENTATION TOOLS & SKILLS

▪ *Web Pages Development*

CourseAgent is a web-based system, so knowledge about developing and publishing web pages in the Internet is a must. HTML plus some JAVA Script is applied to develop each page in this system.

▪ *Oracle Database Management*

To provide the adaptive functionality, some basic information about each individual must be stored in the system. Because the information contains complex relations, the best place to store them is in a database. Knowledge of designing a nice database to meet all the necessary constrains is crucial in this project. It took quite a bit of time to analyze the characteristic of data, construct the relationships among data, and design and modify the database structure.

▪ *CGI - Perl*

All of information for this web-based system is stored in the database and then a CGI script is needed in this project for web pages to communicate with database system. Here, Perl is applied as the CGI.

▪ *SQL*

Perl is the bridge between web pages and database; however, SQL is used to query needed information from the database. Based on the adaptive functionality here in *CourseAgent*, complex SQL statements are applied.

EVALUATION ALGORITHM

The algorithm below shows how *CourseAgent* calculates the average course rating based on different career goal. The range of rating value is from 0 to 4 (*0 – irrelevant & 4 – definite required*). After an evaluation is received, the system would also calculate the Average Rating for the course on different career goal and stored the calculated value in table “tbl_goal_result”.

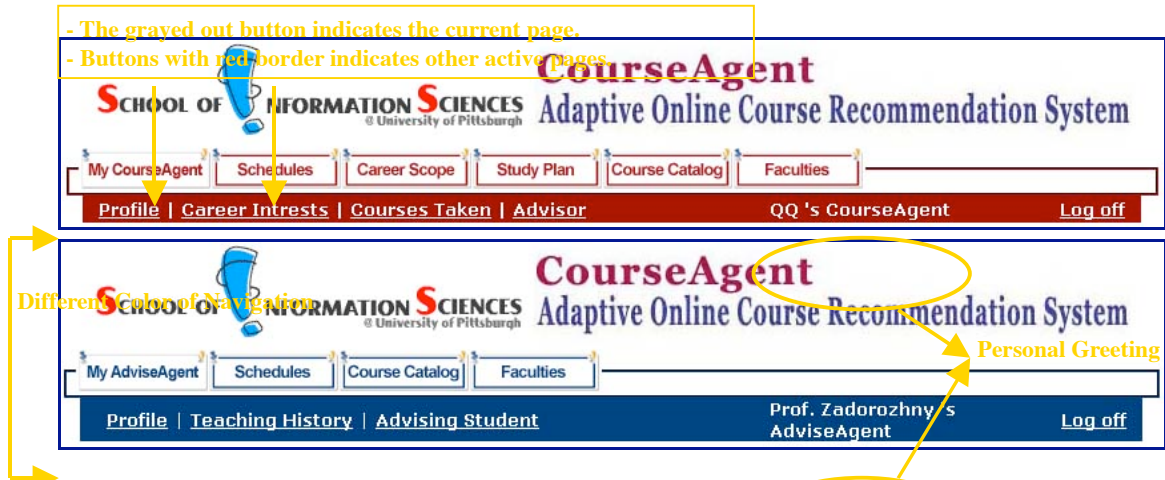
$$AverageRating(Course_x \text{ on } Career_y) = \frac{\sum_{x,y,n} Course_x Career_y Rating_n}{NumberofCourse_x Career_y Rating}$$

While *CourseAgent* is suggesting courses, the following algorithm is applied:

I f $AverageRating(Course_x \text{ on } Career_y) \geq 3$,
then $Course_x$ would be recommended when one of user’s career goal is $Career_y$

ADAPTIVE FEATURES & ALGORITHM



- Support system login to retrieve personalized information and navigations through out the whole system, such as user greetings, and different tools in the navigation for different type of users. (Please see Figure 2. & Figure 3. in the Interface Design)



- Store, retrieve, and modify provided information, such as career goals, course evaluation, and personal information. In order to have the best adaptive functionalities, information about course evaluations and personal career goals are strongly recommended. (Please see Figure 4. & Figure 8. in the Interface Design)


Adaptive Schedule View

In the Schedule view, users are able to see a list of courses offered in a selected semester with further indications about courses taken, courses recommended by advisor, and courses related to personal career goals. (Please see Figure 5. & Figure 6. in the Interface Design)

- Courses taken:** Course displayed with gray color
- Courses recommended by advisor:** Courses preceded with an 
- Courses related to career goals:** Courses preceded with numbers of  depends on how many career goals the course is rated relevant.
- View Evaluation:** More detailed course information and evaluation could be viewed by clicking the link.


- **Adaptive Career Scope View**

In the career scope view, users are able to see a list of courses listed under each relevant career goal based on the user's rating about those courses. For each career goal, there is a drop-down menu showing courses are generally rated as relevant to the career goal but hasn't taken by the user yet. Users could select any of the courses and put it into your study plan for the future use. *(Please see Figure 7. in the Interface Design)*

- **Courses taken:** All courses are displayed with gray color because here in the career scope view only shows courses taken.
- **Course rating:** User's own rating about the course indicates in numbers of . Rating range is from 0 to 4.
- **Course Evaluation:** More detailed course information and evaluation could be viewed by clicking the link.

- **Adaptive Course Catalog View**

In the course catalog view, users are able to see a complete list of courses offered in each program at IS School. Each course is listed under its category of field, such as cognitive science, with further indications of courses taken, and courses related to career goals.

- **Courses taken:** Course displayed with gray color
- **Courses related to career goals:** Courses preceded with numbers of  depends on how many career goals the course is rated relevant.
- **Course Evaluation:** More detailed course information and evaluation could be viewed by clicking the link.

- **Adaptive Course Evaluation View**

In the course evaluation view, users are able to see the detailed information and evaluation about a course. The rating displayed is the average of all rating towards the specific course provided by users and the range of rating is from 0 to 5. Only ratings regards to the user's career goals will be displayed. *(Please see Figure 6. in the Interface Design)*

- **Course rating:** Average of users' rating about the course indicates in numbers of . Rating range is from 0 to 4.